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BIRMINGHAM has been in a bit of a bustle for several days past: science and *savans*, music, manufactures, and paintings, concurred to attract a large number of visitors to what the Bishop of Oxford called the "great practical metropolis of the kingdom,"—he might have said, of the world. We allude, of course, to the "Festival," the British Association for the Advancement of Science, the Exposition of Manufactures and Art, and the Exhibition of the Birmingham Society of Artists,—or rather, the exhibition of modern works of art in the *rooms* of the Birmingham Society of Artists.

Birmingham is a wonderful place, when thoroughly comprehended; but this is not to be done by a glance. As the Rev. Professor Robinson, the new president of the Association, observed at the dinner:—"Where in the whole world could be, and men like him, whose delight it was to have their theoretical knowledge enlightened by the intelligence and skill of practical men,—where on earth could they learn such new and extraordinary things, and see a development beyond any thing they could have conceived of the application of the principles to which they had devoted their lives;" and never let the merely practical men forget that it is to science they are indebted for the discovery of principles out of which processes grow,—that science has increased their powers and directed their labours?

We would say, with the president, of the works of Birmingham, though we could not go wholly with him in applying the remarks, as he did, to the present exposition there—"Days and months would be consumed in viewing those extraordinary creations and treasures of industrial art, and on the last day there would be still much to wonder at and to learn. What a development of power—what an amount of knowledge! What patient perseverance and industry exist and reign where such things are! What a noble school to open men's minds to a full conviction of the powers before them of the boundless mind that only wanted to be explored, but which, to be explored in its widest range and its fullest extent, must be explored under the guidance of the lamp of knowledge! It was not by mere blind and tentative experience that they had been able to realise the marvellous conceptions they had arrived at. They told as clearly as a book did the mind of its author,—they told in unmistakeable distinctness that these men must have been among the giants of their race,—that however they among their books might think highly of their own attainments, there was a far wider field, a far greater number of labourers teaching them what they knew of the past."

At the opening meeting, on the 12th, the professor spoke eloquently of the value of association, and maintained that science can be advanced only by its means.

"The power of association," said he, "of combining united labour, is confessed in all ordinary undertakings, in arts, in manufactures, and in politics. What then is there new in applying it to science? There is nothing new—the novelty is in recognizing its efficacy. Observe, in the first place, that although science—at least physical science—is of comparatively recent origin, physical knowledge is of very ancient date. Even from the origin of our race it seems to have been the object of our desire. Some sought it for the influence and power it gave them over mankind; some from the high instinct which leads the noble mind to see its beauty, and appreciate its worth. Even in the first glimmer of history, the astronomy of the Assyrian magi looms through the dark. Geometry, which might be the champion and guide of astronomy, stands forth in feeble development amidst the antiquities of India. The sepulchres of Etruria, of Egypt, and of Nineveh, give up their treasures to prove that even in that remote date was developed in no low degree that practical chemistry which has been transmitted to us by the Arabians, their successors. The architecture of the middle ages displays a knowledge of the principles of equilibrium and power, which fills the mind capable of appreciating it with admiration and wonder beyond that inspired by marvels of modern art. The writings of Roger Bacon and Kirch show that much of the rudiments and ulterior aims of experimental physics was known in the cloister. But although the elements were there, there was no vivifying principle to combine them into a living body. Association was wanting, not intellectual power and sagacity. The Greeks possessed that in a measure equalled perhaps by no other variety of mankind. But the unhappy element of discord, which seemed inherent in their nature, and which split their philosophers into aggressive sects and their nations into hostile fragments, prevented the union necessary to a development of science. But at last that great principle was revealed in one of those mighty movements which stirs up the world of mind from time to time, as those of geology disturbed the earth at the commencement of some great formation. We find that now, united in the brotherhood of knowledge, they have become as anxious for publication as they were before for secresy. Communication and intercourse have helped investigation: each seeks the other for aid, and the only jealousy that is now shown is lest they should be anticipated in important discoveries or successful results.

The reverend speaker erred in his statement, and lost an illustration, when he so spoke of mediæval architecture. The principle of association was therein carried out in an extraordinary degree, and the result was extraordinary progress.

In answering those who asked, "of what use is science?" the president said,—

"There is not a single element of our commercial prosperity in which the vivifying power of science might not be felt, in which the loss arising from want of that certainty of action which mere unenlightened practice can never attain, does not reach an amount which, if stated in figures, would astound the most thoughtless. For instance, the causes which in our great cities hasten the death and debase and embitter the life of so many, have at last been forced by chemists and physiologists on the notice of the public. Look at Dr. Smith's report on the 'Air and Water of Towns,' in our volume; and when we think that the victims of the deadly influences which are there revealed are chiefly found among the people whose industry is the foundation of our greatness,—that every year cut off from the life of each of these is so much subtracted from national wealth,—even were all moral sense or religious feeling dead in us, we must confess that the knowledge which is capable of averting them 'is of use.' The ships that bear the treasures produced by this industry through the world are lost to a fearful amount,—nearly *three* daily. What are they worth—ship, cargo, men?—and most of them perish from want of nautical science or from unscientific construction. How many men have been ruined by searching for minerals, when the merest smattering of geology would have dispelled their delusion? On the other hand, the agricultural produce of our islands might be doubled by a more perfect application of the principles of botany and chemistry. The manufacture of iron has been augmented six-fold by the use of the puddling furnace and the hot-blast,—both gifts of theory. How gigantic a result is this, without reference to the increase in the thousand arts of which this immense supply of that most precious of metals is the exponent."

At the *soirée*, on the following day, Mr. Gassiot exhibited the electric light; but what was said by Mr. Faraday and others on the occasion, would not serve to encourage the ingenious men who are at this time striving to bring it into practical operation.

The papers read in the various sections were numerous—many of them valuable, but they present no particularly salient points. In the mechanical section, Mr. Robert Stephenson, who ably presided, gave an interesting account of the accident to the hydraulic press at the tubular bridge across the Menai Straits. In allusion to a peculiar state of pulsation or vibration observed throughout the tube during the lifting, Professor Willis and Mr. Webster made some remarks. The latter considered that this pulsation might have had some influence in causing the fracture. There might be a conspiration of vibration in the tube and the press, *which would destroy the cohesion in the particles of the metal, and cause the fracture.* An interesting question this, which may show the importance of some recent remarks in THE BUILDER on this very subject of vibration and its effects on iron. Mr. Roberts suggested that in casting the new hydraulic cylinder, the fluid metal should be poured into the mould *spirally*, to obviate the unequal contraction, to which the accident was attributed. The casting, however, has taken place, it is said, on the most approved principle, and after a week's annealing the cylinder will be ready for transmittal to the Menai.*

Mr. Heaton exhibited a clever invention for preventing the oscillation of locomotives on railways.†—Mr. Whishaw stated, as to his

* The *Birmingham Journal* thus reports the conversation:—"Mr. Stephenson proceeded to explain the precautions that had been taken to avoid the consequences of any accident. It was originally intended that the tube should be lifted 6 feet, that a link should then have been taken off, and the space built up. This was happily not carried out, and such was the care taken that as the tube rose men were stealing in, so to speak, small planks of timber. But for these precautions the fall would have been fatal to the whole structure,—for, as it was, it fractured bearers of cast-iron upwards of 500 tons weight. The tube was never for a moment suspended in air, and he had since taken the additional precaution of packing the space between the cross-heads and the pump with small iron wedges. No accident could now take place. The fracture in the cylinder occurred in what might have been considered the very strongest place. The pressure at the time was no more than 3½ tons to the square inch—by no means an unusual pressure. As connected with the cause of the accident, he might state that a short time previously, when the presses on both ends were working simultaneously, it was remarked that the tube had a *strange tremulous motion along its whole surface.* In a short time it increased until the vibration assumed the character of a short wave. At every action of the pump the whole mass seemed to acquire a state of pulsation, comparable to nothing but the pulse of a man's arm. The presses were stopped, and since, they have only been worked at one end. With respect to the immediate cause of the accident, he might state that the shape of the cylinder-square was not the best, and no doubt the weakness had arisen from unequal cooling.—Dr. Robinson remarked upon the singular fact of the vibration spoken of by Mr. Stephenson. He (Dr. Robinson) presumed that the motion in the end of the tube being raised was reflected from the fixed end, and hence the vibration.—Mr. Stephenson said the fact of his having allowed the damaged cylinder to be used after he knew it was faulty had been strongly commented upon. In answer to that accusation of indiscretion, he begged to state that the fault lay in the collar of the casting, where no pressure came.—Mr. Roberts remarked that the way to obviate vibration was to work the engines at unequal speed. He considered that the shape of the casting was bad, and the mode of casting also not the best. It would greatly improve the strength of such work if spiral casting were to be adopted; that is, to pass the metal into the mould in a spiral direction.—Professor Willis and Mr. Webster followed with some remarks on the subject of vibration; the latter gentleman considering that the pulsation spoken of might have had some influence in causing the fracture. There might be a conspiration of vibration in the tube and the press which would destroy the cohesion in the particles of the metal, and cause the fracture."

† Mr. Heaton proposes to attach a weight with connecting rod, and an auxiliary crank, to the head of the crank pin, equal to the weight of the piston and its gearing, so as to make the weight run to the left hand at the same instant the piston goes to the right. The blow to stop the piston and make it return will be received in the auxiliary crank, instead of in the wheel, producing a neutral point in the centre and steadiness of motion; for when the blow is received in the wheels, the cranks being at right angles, it is communicated through the axle, and gives a twisting motion to the whole framing of the engine.